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# Potentiale von Künstlicher Intelligenz für eine bessere Gesundheitsversorgung

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# DATA MANAGEMENT INEFFICIENCIES IN HEALTHCARE HAVE A MASSIVE IMPACT ON ECONOMY, PEOPLE'S SAFETY AND QUALITY OF LIFE

## Challenges of Healthcare Data

**2.3 zettabytes of healthcare data by 2020**

**80 % of data is unstructured ~60 % is useful if annotated**

**Two-thirds of doctors and nurses time** is spent handling documentation

## Wasteful Spending in Healthcare

**Administrative errors**
€2.3 bn due to billing errors, in German hospitals

**Medical errors & sub-optimal decisions**
€21 bn due to adverse events, in EU

**Poor organization & coordination**
€330 bn in bureaucratic inefficiencies, in USA

WITH AVERBIS INFORMATION DISCOVERY, WE TARGET THESE CHALLENGES AND CREATE MEASURABLE VALUE FOR HEALTHCARE.

# DATA MANAGEMENT INEFFICIENCIES IN HEALTHCARE HAVE A MASSIVE IMPACT ON ECONOMY, PEOPLE'S SAFETY AND QUALITY OF LIFE

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## CLINICAL RESEARCH

"20.000km of unused patient records per hospital"

Source: University Hospital Freiburg

## PATIENT RECRUITMENT

"93% of US clinical trials fail to recruit in time. Up to $8m cost per day and trial"

State of the Clinical Trials Industry: A Sourcebook of Charts and Statistics, Center Watch, 2008. Beasley, "Recruiting" 2008


## CODING AND BILLING

"Every 2nd hospital bill in Germany is wrong. Up to 2,3B damage"

http://www.spiegel.de/wirtschaft/soziales/krankenkassen-abrechnungen-der-kliniken-oft-falsch-a-974292.html

## DECISION SUPPORT

"250k deaths per year in US due to medical errors"

https://www.bmj.com/content/353/bmj.i2139

# …AND CAN BE TARGETED BY AI TECHNOLOGIES

## TEXT MINING / MACHINE LEARNING

*Patient A suffered from* muscle weakness
*and mild* blepharoptosis

## TERMINOLOGIES

Pompe Disease
- makroglossia
- myotonia
- ptosis

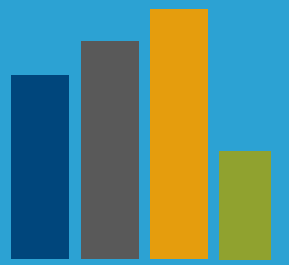
HEALTH discovery

## SEMANTIC SEARCH

Pompe Candidates

*Patient A suffered from* muscle weakness
*and mild* blepharoptosis

## VISUALIZATION



*# Patient per disease*

*progression of new diseases*

# TEXT MINING – DISCHARGE PIPELINE


## Diagnoses

- ICD10 Codes
- Context

## Lab Values

- Parameters
- Values (quant./qual.)
- Units
- Normalisation
- Interpretation*

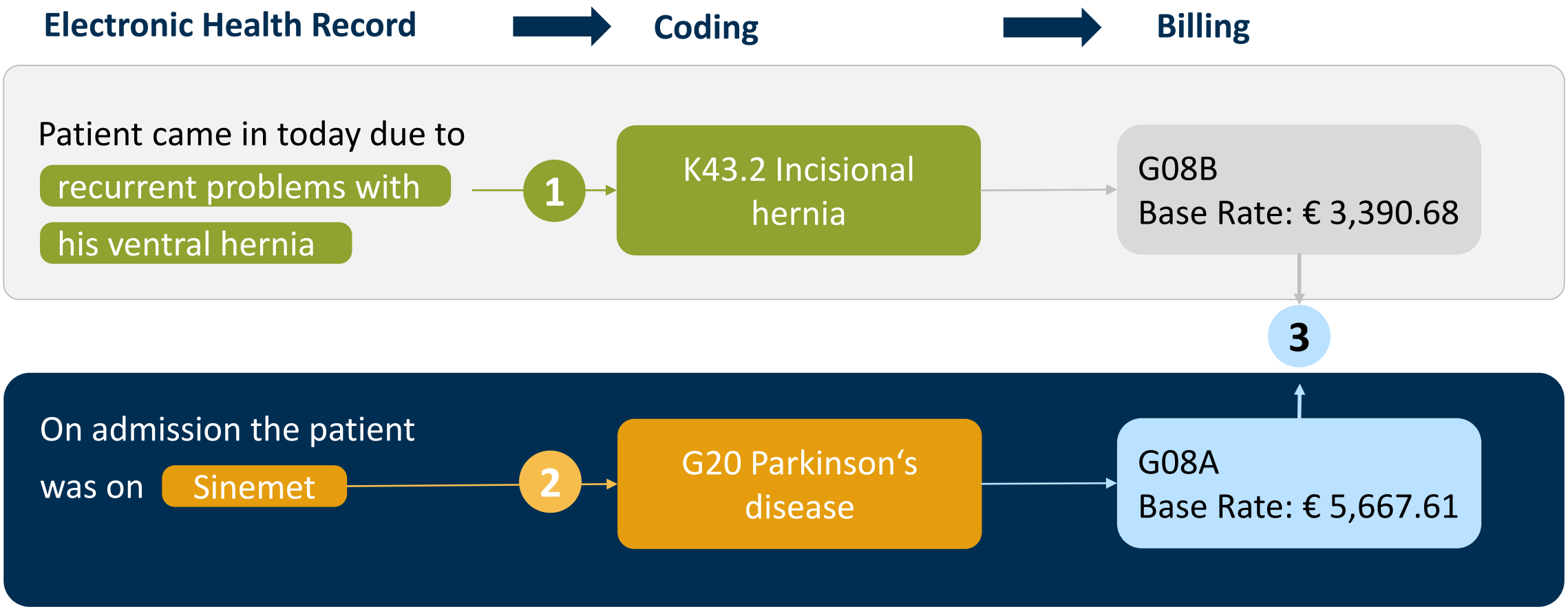
## Drugs

- Ingredients
- Brand Names
- Strengths
- Dose Forms
- Dose Schemes

## Temporal Aspects

- Length of Stay
- Creation Date

# CODING AND BILLING



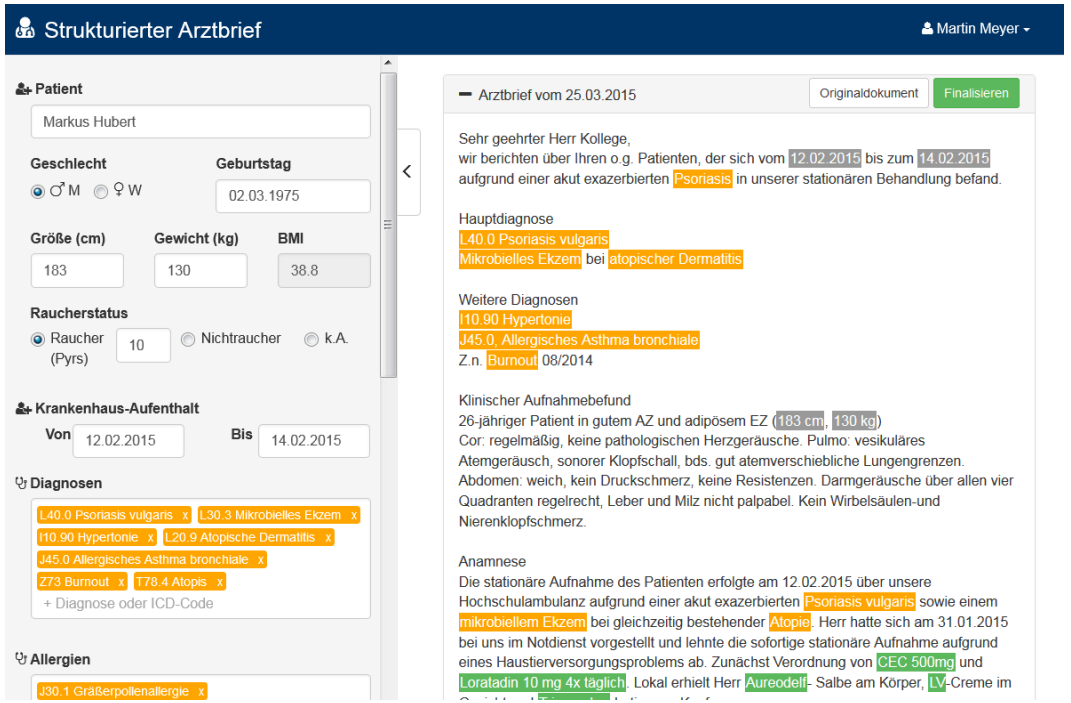
# CODING WORKSTATION FOR PRIVATE DOCTORS

## Background:

- Private practitioners receive a large number of hospitals and specialists every day
- They spend 1-2 hours a day processing, reading and implementing recommendations

## Project Goal:

- Automation of the processing of daily correspondence
- Show relevant topics at a glance
- Secondary use of anonymized health data for clinical research



# CODING IN PUBLIC TUMOR REGISTRIES

Krebsregister Baden-Württemberg

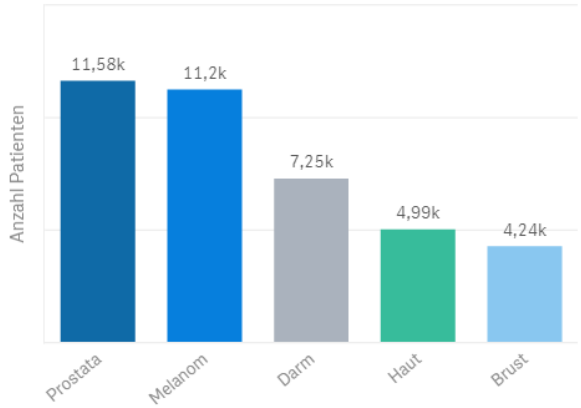
## Tumorregister

HEALTH discovery

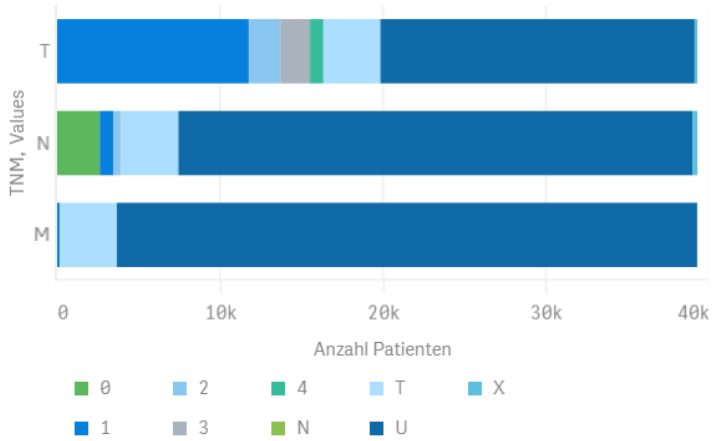
Anzahl Patienten

39.437

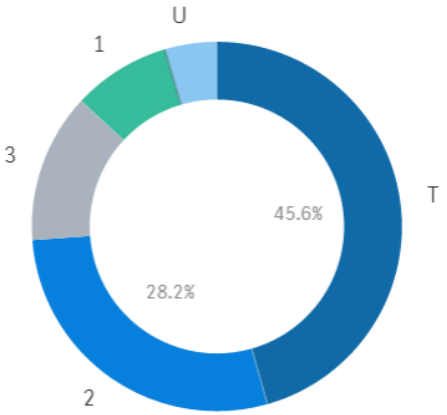
### Tumorverteilung



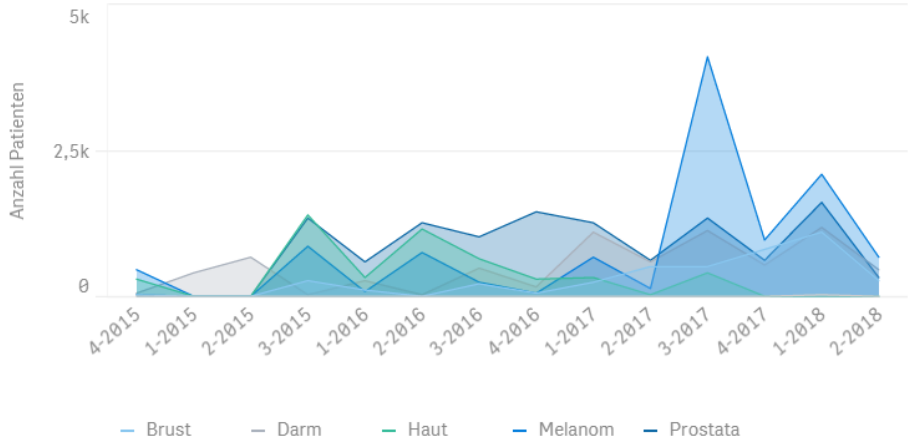

### TNM-Klassifikation



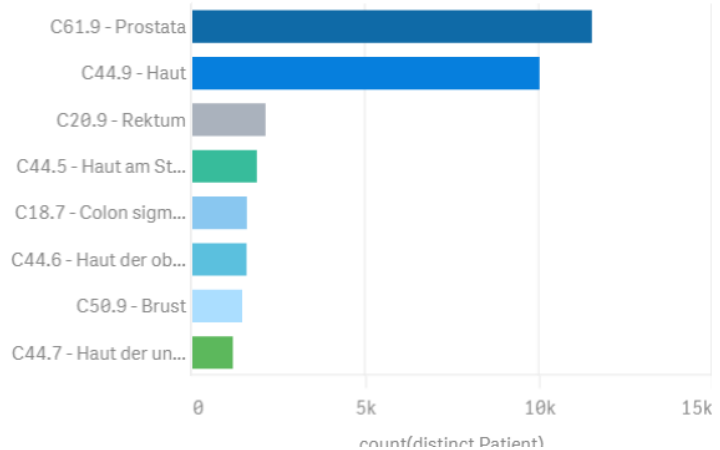

### Grading



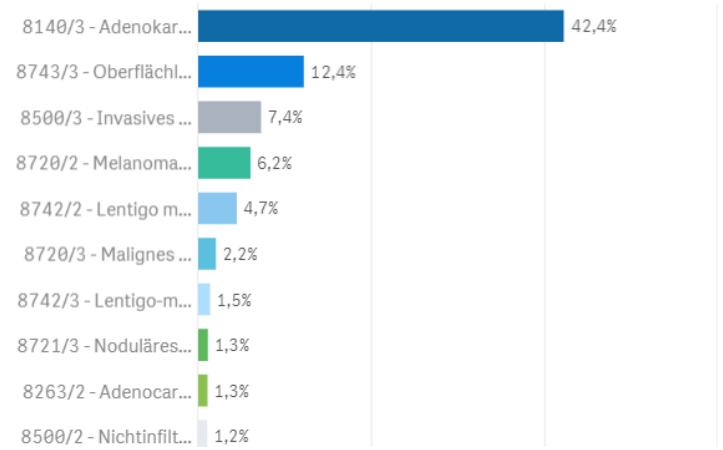

### Verlauf der Tumorhäufigkeiten




### Topographie-Verteilung

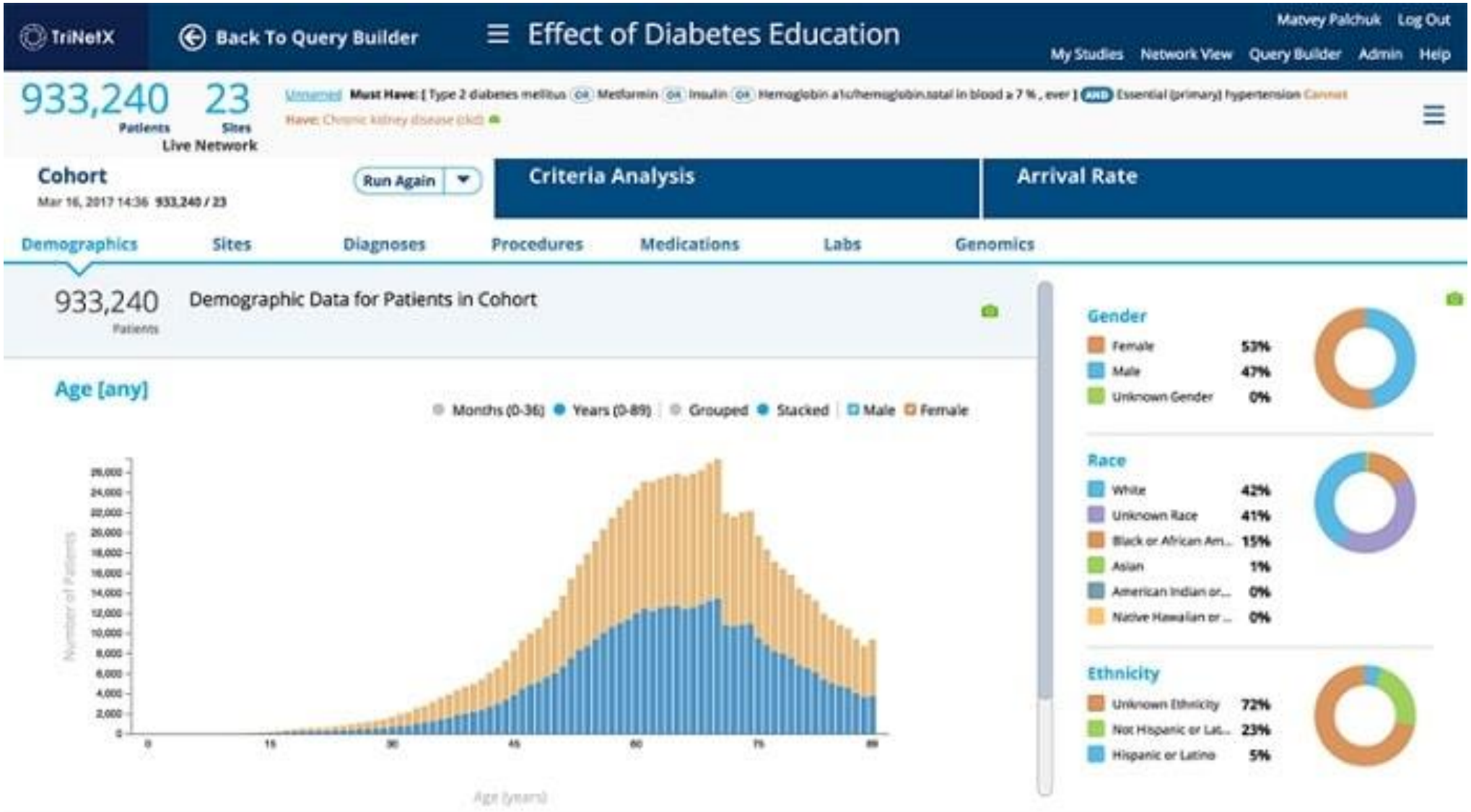



### Histologie-Verteilung



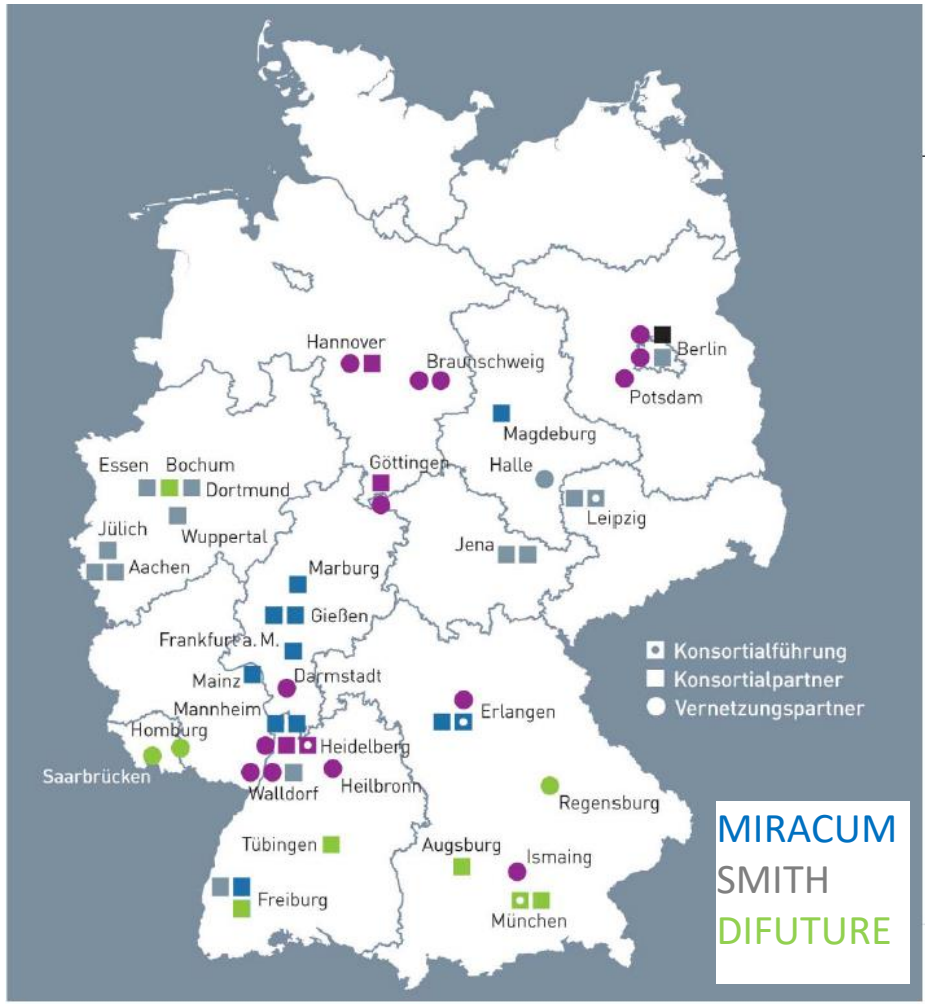
# AUTOMATED PATIENT RECRUITMENT

Averbis is the NLP engine behind TriNetX, the Global Health Research Network



# MEDICAL INFORMATICS FUNDING SCHEME

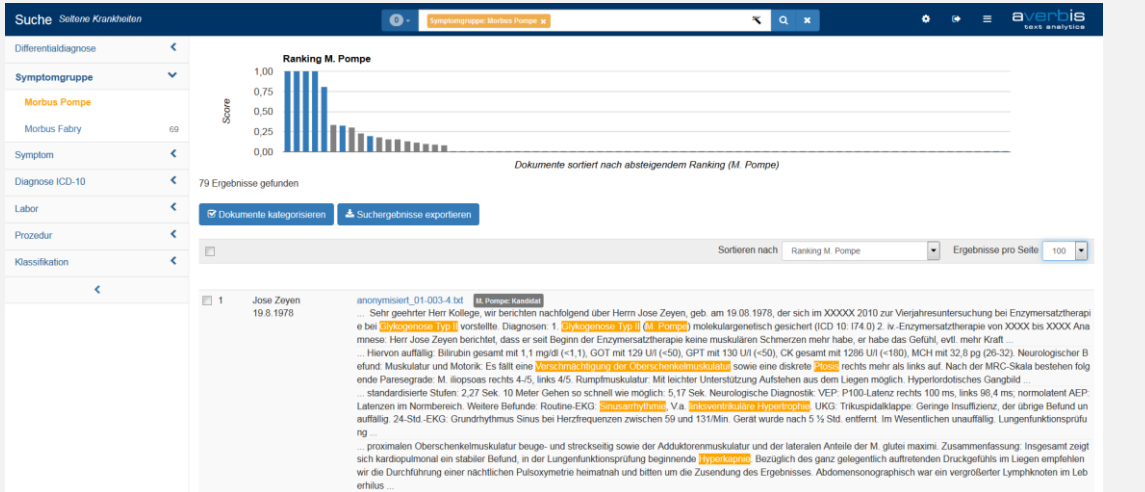
- We are the text mining partner in several consortia of the „Funding Scheme Medical Informatics“
- This funding scheme invests ~30 Mio per consortium in the upcoming 4 years to improve research in the area of medical informatics and to foster data driven health research
- Participating hospital will create so-called „data integrity centers“ which collect patient records for clinical research
- We are the partner to turn unstructured patient records (lab reports, progress notes, pathology reports…) into structured information
- Sample Use-Cases:
  - Rare Diseases (MIRACUM)
  - Phenotyping Pipeline (SMITH)



# DIAGNOSIS SUPPORT FOR RARE DISEASES

- **Problem**
- About 7.000 rare diseases with about 350M patients world wide
- It takes about 8 years to diagnose rare disease patients
- There are Increasing therapy options

- **Approach**
- Definition of relevant phenotypes for 10 neurological diseases
- Medical records were screened at 7 university hospitals for phenotypes
- Ranked lists of patients were produced using sophisticated statistical algorithms
- Patient candidates were invited to a genetic test

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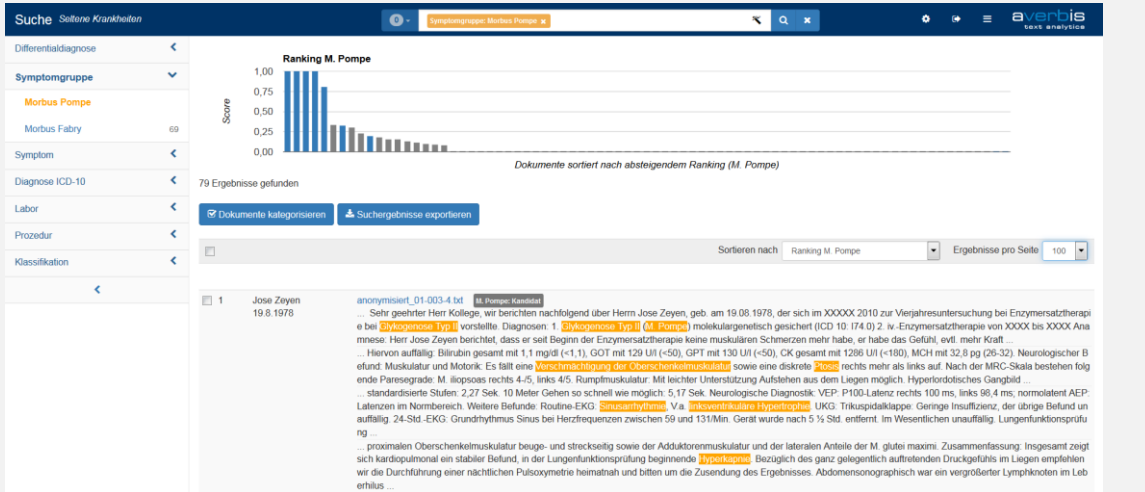
# DIAGNOSIS SUPPORT FOR RARE DISEASES

- **Results**
- In the pilot phase, 4 patients with Pompe disease and 4 heterozygote *NPC1* mutation carriers were identified in Munich.
- More than 500.000 data sets from four centres were analysed for three diseases: Niemann-Pick type C disease, Pompe disease and Fabry disease. Four novel Pompe patients and 3 heterozygote *NPC1* or *NPC2* mutation carriers were identified, who had not previously been diagnosed.

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# AT A GLANCE

- Data-driven inefficiencies in Healthcare have a massive impact on economy, people's safety and quality of life
- Artificial intelligence has the potential to automate cognitive routine processes and make computer-aided predictions
- Averbis is a pioneer in AI-based natural language processing for Healthcare and Pharma
- Our AI Platform Information Discovery is widely used for clinical research, decision support, pharmacovigilance and patient recruitment
- Visit us in hall 4.2, booth C 105

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## We‘re hiring. Join our team!

https://averbis.com/karriere/

careers@averbis.com

# Interested? Get in touch!

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Email: philipp.daumke@averbis.com

# Publikumsfrage 1:

- Welche Einsatzbereiche für künstliche Intelligenz wurden vorgestellt?
  - Klinische Forschung
  - Leistungsabrechnung
  - Entscheidungsunterstützung
  - Patientenrekrutierung für klinische Studien

# Publikumsfrage 2:

- Welche zwei grundsätzlichen Methoden gibt es im Bereich natürlicher Sprachverarbeitung?
  - Regelbasierte Ansätze
  - Maschinelle Übersetzung
  - Statistisch basierte Ansätze
  - Spracherkennung

# Publikumsfrage 3:

- Welche Potenziale birgt Künstliche Intelligenz für eine bessere Gesundheitsversorgung in naher Zukunft?
  - Automatisierung von kognitiven Routinearbeiten wie Leistungskodierung
  - Entscheidungsunterstützung von medizinischem Personal
  - Vollständiges Ersetzen von Ärzten bei der Patientenbehandlung
  - Die Ausrottung von Krebs weltweit